

in the specific gravities. The cold stratum mentioned on 23rd, 24th, and 26th August was wanting.

BLACK-SEA TEMPERATURES.

Endeavours were made to get a series of densities and temperatures in the Black Sea, in order to ascertain the conditions at all depths.

The steam cutter with much difficulty, not unattended with danger, obtained an offing of six miles on the 17th of October.

The wind was strong and the sea high, but time would not allow of choice of days, and the N.E. wind was almost permanent.

The results obtained show a uniform density of 1.012 from surface to bottom in a depth of 38 fathoms.

Temperatures showed great decrease at the bottom, and the cold stratum observed on the 23rd, 24th, and 26th of August was found here also.

X. "Normal Primary Heptyl Alcohol." By HARRY GRIMSHAW and CARL SCHORLEMMER, F.R.S. Received May 6, 1873.

One of us has shown that by oxidizing the primary heptyl alcohol from normal heptane acid is formed, which is identical with *œnanthyl*ic acid from *œnanthol**. *œnanthyl*ic acid is therefore a normal acid; and as by the distillation of castor-oil any quantity of *œnanthol* may be obtained, this aldehyde appears to be the best starting-point for the preparation of the hitherto almost unknown normal heptyl compounds.

Some years ago Bouis and Carlet found that, by the action of zinc and acetic acid on *œnanthol*, a heptyl acetate is formed, which yielded a heptyl alcohol boiling at 165°†. If these statements be correct, this alcohol cannot be a normal compound, for its boiling-point is only 8° higher than that of normal hexyl alcohol. One of us, on repeating these experiments, did not, however, succeed in obtaining a heptyl alcohol, the chief product of the reaction consisting of high-boiling condensation-products of *œnanthol*‡.

To convert *œnanthol* into the alcohol we have therefore made use of the excellent method which Lieben and Rossi have employed so successfully for the reduction of other aldehydes.

œnanthol was shaken with fifty times its weight of water, and sodium amalgam and an equivalent quantity of sulphuric acid were gradually added. The product of the reaction was a mixture of heptyl alcohol and another very high-boiling liquid, the separation of which could be easily effected by distillation.

The primary heptyl alcohol thus obtained is a limpid, somewhat oily liquid, possessing an aromatic odour and boiling at 175°–177°, if the

* Phil. Trans. vol. cxlii. p. 111.

† Comptes Rendus, vol. l. p. 140.

‡ Ann. Ch. Pharm. vol. cxxxvi. p. 261.

whole column of mercury is surrounded by the vapour. The high boiling-point is a further proof that this alcohol, as well as *enanthylic acid*, is a normal compound.

We are now acquainted with the complete series of normal alcohols up to octyl alcohol. The following Table shows that the boiling-points in this series increase very regular for each increase of CH_2 . The boiling-points which are here given have been determined, either by the whole column of the thermometer being immersed in the vapour, or, if this was not the case, the required corrections were applied :—

Table of Normal Alcohols.

	Boiling-point.	Difference.	Observer.
Ethyl alcohol, $\text{C}_2\text{H}_6\text{O}$. .	78·4	—	Kopp.
Propyl alcohol, $\text{C}_3\text{H}_8\text{O}$. .	97–98	19	Different observers.
Butyl alcohol, $\text{C}_4\text{H}_{10}\text{O}$. .	116·0	18·5	Lieben and Rossi.
Pentyl alcohol, $\text{C}_5\text{H}_{12}\text{O}$. .	137·0	21	Lieben and Rossi.
Hexyl alcohol, $\text{C}_6\text{H}_{14}\text{O}$. .	157·0	20	Franchimont and Zincke.
Heptyl alcohol, $\text{C}_7\text{H}_{16}\text{O}$. .	175–177	19	H. G. and C. S.
Octyl alcohol, $\text{C}_8\text{H}_{18}\text{O}$. .	196–197	20	Renesse.
Mean		19·6	

XI. “On the Organization of the Fossil Plants of the Coal-measures.—Part V. *Asterophyllites*.” By W. C. WILLIAMSON, F.R.S., Professor of Natural History in Owens College, Manchester. Received May 17, 1873.

(Abstract.)

On two occasions the author directed attention, in the Proceedings of the Royal Society (vol. xx. pp. 95 & 435), to the structure of some stems which appeared to him to belong to the well-known genus *Asterophyllites*, briefly pointing out at the same time their apparent relations to a strobilus of which he had previously published figures and descriptions (Transactions of the Literary and Philosophical Society of Manchester, third series, vol. v. 1871) under the name of *Volkmannia Dawsoni*. In the present memoir he gives a detailed exposition of the various parts of the plant, including the roots, rootlets, stems, branches, leaves, and fruit, in different stages of their development. This is done chiefly in two modifications of the primary type—one from the Lower Coal-measures of Oldham in Lancashire, the other from those of Burntisland. In its youngest state, the Oldham form first appears as a mere twig, having a central fibro-vascular bundle enclosed in a double bark. The vascular bundle consists entirely of vessels which are chiefly, if not wholly, of the